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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/509,309

09/27/2004

Sandrine Vialle

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11/17/2006

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EXAMINER

NGUYEN, LEON VIET Q

ART UNIT

PAPER NUMBER

2635

DATE MAILED: 11/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/509,309

Applicant(s)

VIALLE ET AL.

Examiner

Leon-Viet Q. Nguyen

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2635

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-8 and 10-19 is/are rejected.
- 7) ☐ Claim(s) 5 and 9 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) *
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08) *
- Paper No(s)/Mail Date 9/27/04

VU LE
SUPERVISORY PATENT EXAMINER

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 9/27/2004 was filed after the mailing date of 9/27/2004. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Objections

3. Claims 4 and 8 recites the limitation "the symbol data". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3, 6, 11-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Raleigh (US 6377631).

Re claim 1, Raleigh discloses a method of closed loop wireless communication of signals using an adaptive transmit antenna array (col. 2 lines 10-15, col. 7 lines 54-57), in which a plurality of copies of signals to be transmitted by said transmit antenna array are produced with delays and weights (col. 6 lines 42-45, col. 12 lines 7-11), that are functions of the multi-path transmission channel characteristics (col. 4 lines 19-20, col. 18 lines 9-18) from said transmit antenna array to a receive antenna array of a receiver and are combined before transmission by said transmit antenna array (fig. 11, input symbol vectors, z , combined in the transmit spatial processor), characterized in that the delays and weights of the transmit copies for each transmit antenna element are functions of the respective multi-path transmission channel characteristics from that transmit antenna element to the receive antenna array such that the multi-path signal components propagated to each receiver element are received with distinguishable delays according to the propagation path (col. 4 lines 20-25, col. 10 lines 15-17 and lines 38-39), and that said receiver combines the received signal components from each receive antenna element with delays and weights (col. 8 lines 41-46, col. 19 lines 16-19) that are respective functions of the multi-path transmission channels.

Re claim 2, Raleigh discloses a method wherein said receiver comprises a multi-finger RAKE receiver that copies the received signals from said receive antenna array

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with delays and weights that are respective functions of the multi-path transmission channels and combines the copied received signals (col. 13 lines 24-29, the RAKE receiver of Raleigh is the digital section of a receiver which permits the separation of relevant signals from all other signals with coding).

Re claim 3, Raleigh discloses a method wherein said delays and weights of the multi-path transmit copies are respective functions of the multi-path transmission channel characteristics from each transmit antenna such as to maximize at least approximately the output of said receiver (col. 8 lines 49-53, col. 19 lines 24-27).

Re claim 6, Raleigh discloses a method wherein the number and delay position of said multi-path transmit copies are selected as a function of the number of multi-path trajectories between the transmit antennas and the receive antennas (col. 6 lines 27-32 and 42-50).

Re claim 11, all of the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claims 1. Furthermore Raleigh discloses a vector, h , resulting from an FIR channel from antenna to antenna (col. 31 lines 10-11). In Raleigh, the FIR is a type of digital filter.

Re claims 12-13, Raleigh discloses a transmitter comprising channel information means for sending channel information from said receiver (fig. 11) wherein said channel

information means comprises a store for possible delay and weight combination functions of the copied signals (210, col. 16 lines 19-29, the column vector of weights comprise the store, col. 19 lines 65-66) and said channel information means identifies delay and weight combination functions from said store as a function of said channel information (col. 16 lines 27-32, the vector includes symbols allocated to subchannels corresponding to each particular bin) from said receiver.

Re claim 14, all of the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 11.

Re claim 15, all of the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 1. Furthermore Raleigh discloses the use of a substantially orthogonalizing procedure, SOP, which decomposes the time domain space-time communication channel that may have inter symbol interference (col. 2 lines 10-19, fig. 8). In the closed loop signal transmission of Raleigh, information concerning the transmission channels is utilized at the transmitter.

Re claim 16, all of the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 2.

Re claim 17-18, Raleigh discloses a receiver comprising channel information means for sending channel information from said receiver (fig. 12) wherein said channel

information means comprises a store for possible delay and weight combination functions of the copied signals (col. 16 lines 47-52, the weighting matrix comprise a store, col. 19 lines 65-66) and said channel information means identifies functions from said store as a function of said channel information (col. 16 lines 55-56) for said transmitter.

Re claim 19, all of the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 15.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Raleigh (US 6377631) as applied to claim 3 above, and further in view of Chiang (US 5535150).

Re claim 4, Raleigh teaches a method wherein said delays and weights of said transmit copies are substantially equal to a matrix w , wherein w is calculated to be substantially equal to the eigenvector corresponding to the largest eigenvalue of the matrix $H^H H$ (col. 19 lines 57-59), where H is the matrix of the equivalent channel seen

by the symbol data (col. 15 lines 4-6) and H^H is the Hermitian transform of the matrix H (it is well known in the art that a matrix with H is the notation for a hermitian matrix, i.e. A^H is the hermitian conjugate of A).

However Raleigh fails to teach where $w_i = (w_{i,1}, w_{i,2}, \dots, w_{i,M})^t$ represents the coefficients of the FIR filter and M is the number of elementary time intervals in the FIR filter delay scheme.

Chiang teaches a FIR filter with weights and signals that would be passed through the filter at predictable time intervals (col. 1 lines 54-59). It would have been obvious and necessitated to have a listing of the weights of the FIR filter.

Therefore taking the combined teachings of Raleigh and Chiang as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the FIR filter of Chiang into the method of Raleigh to suppress multipath interference (col. 1 lines 61-62).

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Raleigh (US 6377631) as applied to claim 6 above, and further in view of Forssén et al (US 5649287).

Re claim 7, Raleigh fails to teach a method wherein the delay positions of said multi-path transmit copies for a given transmit antenna element and the receive antenna array are selected to be substantially equal to $0, q_Q - q_{Q-1}, \dots, q_Q - q_1$, where $q_1 T_s, q_2 T_s, \dots, q_Q T_s$, represent the delays of the Q non-null trajectories between that transmit antenna element and the receive antenna array.

However Forssén teaches preprocessing broadcast data at a radio frequency by using delay (col. 4 lines 23-24) which results in an antenna pattern that is devoid of deep nulls (col. 4 lines 28-32). It would have been obvious and necessitated to have variable names to represent the different delays.

Therefore taking the combined teachings of Raleigh and Forssén as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the signal transmitting method of Forssén into the method of Raleigh to create orthogonal signals (col. 2 lines 65-66) that do not cancel each other out (col. 4 lines 30-32) and are transmitted and received at a mobile station (col. 3 lines 1-3).

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Raleigh (US 6377631).

Re claim 8, all of the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 4. Furthermore, one of ordinary skill in the art would have found it obvious and necessitated to have a matrix in which of the matrix the positions with no values, i.e. nulls, correspond to the unselected values of the matrix w_i .

7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Raleigh (US 6377631) as applied to claim 1 above, and further in view of Chang et al (US 20030072354).

Re claim 10, Raleigh fails to teach a method wherein the maximum delay between said multi-path transmit copies for any one transmit antenna is substantially equal to the maximum delay between the multi-path trajectories between that transmit antenna and the receive antennas. However Chang teaches using multi-path channels with larger delay spread (§ 0085).

Therefore taking the combined teachings of Raleigh and Chang as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the technique of utilizing channels with the largest delay spread as taught by Chang in conjunction the method of Raleigh to combat fading impairment(Chang, § 0085). It would have been obvious and necessitated to use the same technique on the transmit copies to provide superior performance.

Allowable Subject Matter

8. Claims 5 and 9 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The allowable subject matter in claims 5 and 9 pertain to the the delays and weights equal to the equation $u = (w^H H^H) / \sqrt{w^H H^H H w}$.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leon-Viet Q. Nguyen whose telephone number is 571-

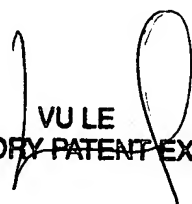
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270-1185. The examiner can normally be reached on monday-friday, alternate friday off, 7:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vu Le can be reached on 571-272-7332. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Leon-Viet Nguyen/


VU LE
SUPERVISORY PATENT EXAMINER